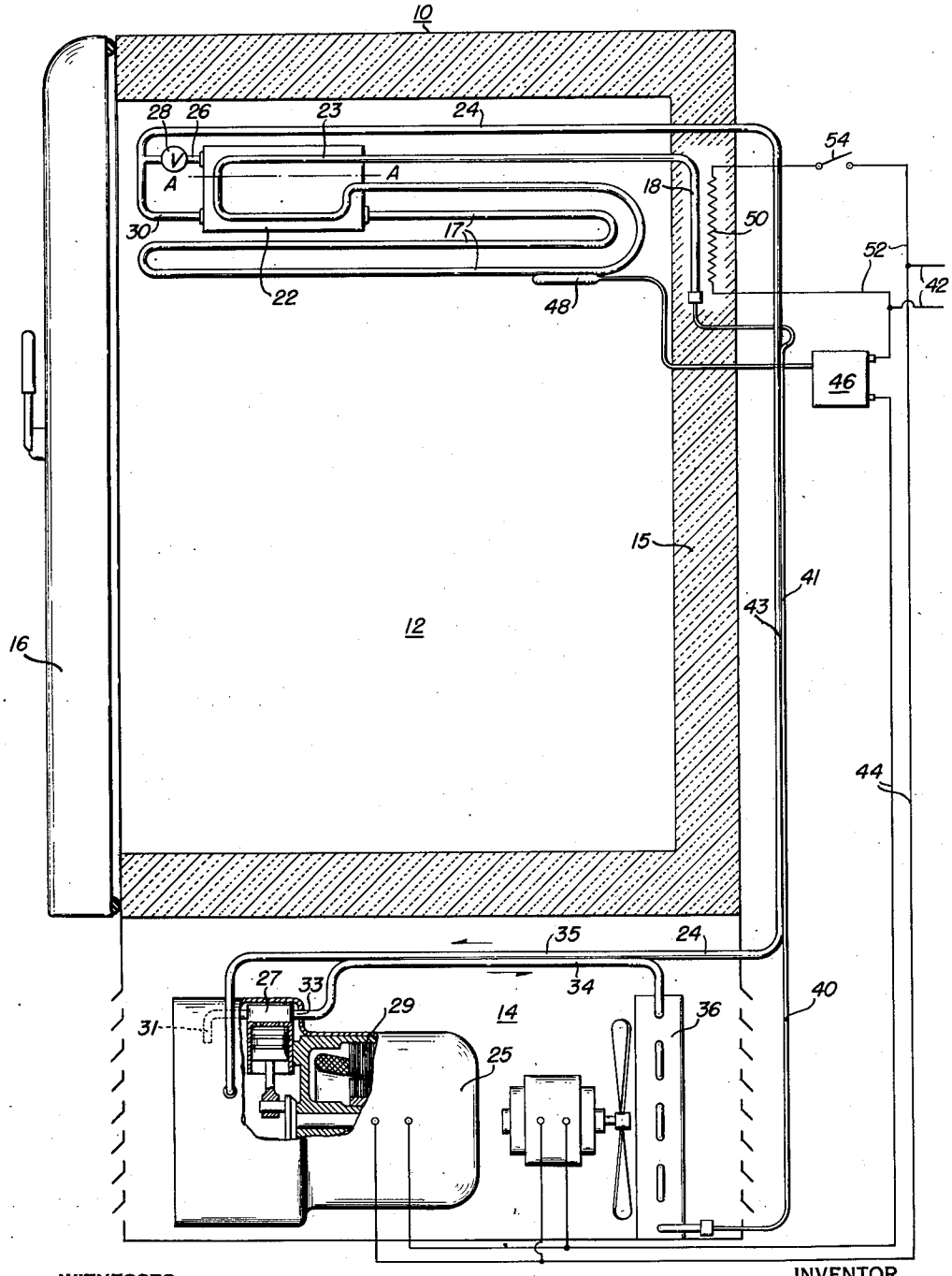
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DEFROSTING REFRIGERATING APPARATUS

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WITNESSES:

E. H. Lutz.

INVENTOR
Graham S. McCloy

BY

ATTORNEY

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DEFROSTING REFRIGERATING APPARATUS

Graham S. McCloy, Springfield, Mass., assignor to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

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This invention relates to refrigerator apparatus and more especially to apparatus which selectively either refrigerates an evaporator or warms the evaporator to melt the frost which may have accumulated thereon.

It is an object of the invention to utilize the refrigerant headers of an evaporator for at least a part of the defrosting mechanism of the apparatus.

It is a further object of the invention to provide a refrigerating and defrosting mechanism which is of low cost and trouble free.

These and other objects are effected by the invention as will be apparent from the following description and claims taken in connection with the accompanying drawing, forming a part of this application, in which the single figure of the drawing is a vertical sectional schematic view of a refrigerator showing the refrigerating apparatus of this invention.

In the drawing, the reference numeral 10 designates a refrigerator cabinet having a food storage compartment 12 in the upper portion thereof and a machine compartment 14 below the food storage compartment. The food storage compartment is provided with thermal insulation 15 and includes a door 16. The cooling element of the food storage compartment 12 comprises a tube 17 having an entrance portion 18 embedded in the thermal insulation 15 of the cabinet 10. The remainder of the cooling unit 17 is located in the upper portion of the food storage compartment 12 and comprises several horizontal passages. The tube 17 empties into a chamber 22 which forms both a refrigerant header for the tube 17 and a trap wherein refrigerant liquid is stored during the refrigerating process of the apparatus. The chamber 22 is in heat transfer relationship with a portion 23 of the tube 17 located near the entrance end thereof.

A suction conduit 24 connects through a tube 26 and a valve 28 with an upper portion of the chamber 22 and through a tube 30 with the lower portion thereof. The suction conduit 24 communicates with a sealed casing 25 which encloses a compressor 27 and an electric motor 29 for driving the compressor 27. The inlet port 31 of the compressor communicates with the interior of the casing 25 and the exhaust port 33 of the compressor 27 connects through a hot vapor line 34 with an air cooled condenser 36. The vapor line 34 is located in heat-transfer relationship with a portion 35 of the suction conduit 24. The outlet of the condenser 36 communicates through a capillary impedance tube

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40 with the entrance portion 18 of the tube 17. A portion 41 of the capillary tube 40 is in heat-transfer relationship with the portion 43 of the suction conduit 24 to improve the efficiency of the refrigerating system.

The electric motor receives power from the lines 42 through the conductors 44. A thermostatic switch 46 is located in one of the conductors 44 and has a temperature sensitive bulb 48 in contact with the tube 17. An electric heater is located in the thermal insulation 15 of the cabinet 10 to heat the entrance portion 18 of the tube 17. The electric heater 50 receives its power through leads 52 from leads 42. A switch 54 is located in one of the leads 52.

Operation

When both the valve 28 and the switch 54 are open, the refrigerating apparatus of this invention operates to refrigerate the food storage chamber 12. Refrigerant liquid is then supplied to the tube 17 from the condenser 36 through the capillary tube 40. The major portion of the liquid vaporizes in the tube 17 to cool it while the remainder of the liquid fills the chamber 22 to the level A—A. The chamber 22 acts as a refrigerant header to allow the refrigerant vapor to separate from the refrigerant liquid and also traps the liquid. The refrigerant vapor is withdrawn from the chamber 22 by the compressor 27 through the tube 26, the valve 28, and the suction conduit 24. The compressor 27 compresses this vapor and discharges it through the hot vapor line 34 into the condenser 36 wherein the vapor is condensed to a liquid. The thermostatic switch 46 maintains the tube 17 at substantially a constant temperature below freezing by periodically starting and stopping the electric motor 29 which drives the compressor 27.

The frost which collects on the tube 17 and chamber 22 requires periodic removal and when this is necessary the valve 28 and the switch 54 are closed. As a result, the refrigerant liquid is withdrawn from the chamber 22 by the compressor 27 through the tubes 30 and 24. This refrigerant liquid flows downwardly through the suction conduit 24 into the portion 35 thereof which is in heat-exchange relationship with the hot vapor line 34. The hot vapor line 34 and also the conduit portion 35 are at a higher temperature than the cooling tube 17 so that the vapor pressure in the tube 17 and the suction conduit 24 is raised to that corresponding to the temperature of the liquid refrigerant in the conduit portion 35. The refrigerant liquid will thus no

longer vaporize in the tube 17 and instead vaporizes in the conduit portion 35. The refrigerant liquid flowing in the tube 17 is heated by the heater 50 to aid in melting the frost on the tube 17 and the chamber 22.

In order to insure that the chamber 22 is emptied of refrigerant liquid to the level of the inlet of the tube 30 when the valve 28 is closed, the chamber 22 is placed in heat-transfer relationship with the portion 23 of tube 17. When the cabinet 10 is being refrigerated, the chamber 22 is normally the coldest portion of the cooling system 17, 22. This is caused by the fact that the suction pressure on the chamber 22 is lower than that on the tube 17 by the frictional drop of pressure in the tube 17. At such a low temperature, there is a tendency for the vapor in the chamber 22 to condense into a liquid when the suction pressure in the conduit 24 is raised. The condensation of this vapor tends to withdraw the refrigerated liquid from the conduit portion 35 and thereby retard the defrosting action. The portion 23 of the tube 17 prevents this by warming the chamber 22 so that the vapor therein does not condense.

Modifications

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof. The chamber 22 may be warmed by means other than the conduit portion 23, for example, by an electric heater. Heat absorbing fins may also be placed on the chamber 22 so that it absorbs more heat from the storage chamber and does not become the coldest portion of the cooling system 17, 22. The chamber 22 need not be placed at the discharge end of the tube 17 but can be placed intermediate the ends of this tube 17. It may also be placed in the suction conduit 24 if precautions are taken to prevent excessive vaporization of the refrigerant liquid trapped in the chamber 22. The tube portion 35 may be heated by any means other than the hot vapor line 34 such as, for example, by an electric heater.

The heater 50 at the entrance portion 18 of the tube 17 is desirable but not essential. Its use accelerates the melting of the frost on tube 17 and header 22 by raising the temperature of the refrigerant liquid leaving the tube portion 18 to above the temperature at which the refrigerant liquid leaves the capillary tube 40.

The valve 28 and the tubes 26 and 30 are merely a contrivance to selectively withdraw either refrigerant vapor or refrigerant liquid from the chamber 29 and any other device which accomplishes this purpose may be substituted therefor.

Conclusion

It will be apparent from the above that this refrigerating apparatus provides for the defrosting of the cooling unit of the apparatus and is relatively simple. If desired, the refrigerant header of the refrigerating system may be used as a part of the defrosting apparatus.

What I claim is:

1. A refrigerating circuit for selectively refrigerating or defrosting an evaporator, said circuit comprising a tube forming an evaporator, a chamber connected to the outlet of said tube, a compressor, a suction conduit connecting said chamber with the inlet of said compressor, valve means for selectively directing the refrigerant from either an upper portion or a lower portion of said chamber into said conduit, a condenser, a hot vapor line connecting the outlet of said compressor with the inlet of said condenser, said hot vapor line being in heat-transfer relationship with a portion of the suction conduit, a liquid line including a flow impeding device for connecting the outlet of said condenser with the inlet of the evaporator, a heater for heating a portion of the tube near the entrance thereof, means for controlling said heater, a portion of said tube subsequent to said heated portion being in heat-exchange relationship with said chamber, and a quantity of refrigerant liquid in said circuit sufficient to fill the lower portion of said chamber during a refrigerating operation of said circuit.

2. A refrigerating circuit for selectively refrigerating or defrosting an evaporator, said circuit comprising a tube forming an evaporator, a chamber connected to the outlet of said tube, a compressor, a suction conduit connecting said chamber with the inlet of said compressor, said suction conduit having two inlets one of which communicates with an upper portion of said chamber and the other with a lower portion thereof, valve means for directing the refrigerant entering said conduit selectively through either of the said inlets, a condenser, a hot vapor line connecting the outlet of said compressor with the inlet of said condenser, said hot vapor line being in heat-transfer relationship with a portion of the suction conduit, a liquid line including a flow impeding device for connecting the outlet of said condenser with the inlet of the evaporator, a heater for heating a portion of the tube near the entrance thereof, means for controlling said heater, a portion of said conduit subsequent to said heated portion being in heat-exchange relationship with said chamber, and a quantity of refrigerant liquid in said circuit sufficient to fill said chamber to above the suction tube inlet communicating with the lower portion of said chamber during a refrigerating operation of said circuit.

3. A refrigerating circuit for selectively refrigerating or heating an evaporator, said circuit comprising an evaporator having an inlet and an outlet, a compressor, a condenser for receiving compressed refrigerant vapor from said compressor, a liquid line including a pressure-reducing device for conducting refrigerant liquid from said condenser to the inlet of said evaporator, a suction conduit connecting the outlet of said evaporator with the inlet of said compressor, means for heating a portion of said suction conduit, a storage vessel located in said circuit intermediate the inlet of said evaporator and the heated portion of the suction conduit and arranged to trap refrigerant liquid, means for releasing said trapped refrigerant liquid, and means for heating said storage vessel to prevent the condensation of refrigerant therein during the time refrigerant liquid is being released from said storage vessel.

4. The refrigerant circuit defined in claim 3 including means for heating the refrigerant liquid flowing in said evaporator when the refrigerant liquid is released from said storage vessel.

5. A refrigerating circuit for selectively refrigerating or heating an evaporator, said circuit comprising an evaporator having an inlet and an outlet, a compressor, a condenser for receiving compressed refrigerant vapor from said com-

pressor, a liquid line including a pressure-reducing device for conducting refrigerant liquid from said condenser to the inlet of said evaporator, a suction conduit connecting the outlet of said evaporator with said compressor, means for heating a portion of said suction conduit, storage means located in said circuit intermediate the inlet of said evaporator and the heated portion of the suction conduit for selectively trapping refrigerant liquid or releasing said trapped refrigerant liquid and a single means for heating said storage means and the refrigerant liquid flowing in said evaporator when refrigerant liquid is released by said storage means.

6. A refrigerating circuit for selectively refrigerating or heating an evaporator, said circuit comprising an evaporator having an inlet and an outlet, a compressor, a condenser, a conduit for conducting compressed refrigerant vapor from said compressor to said condenser, a liquid line including a pressure-reducing device for conducting refrigerant liquid from said condenser to the inlet of said evaporator, a suction conduit connecting the outlet of said evaporator with said compressor, means for heating a portion of said suction conduit, said means comprising a heat exchanger between the conduit carrying compressed refrigerant vapor from said compressor and said portion of the suction conduit, storage means located in said circuit intermediate the inlet of said evaporator and the heated portion of the suction conduit for selectively trapping refrigerant liquid or releasing said

trapped refrigerant liquid and means for heating said storage means during the time refrigerant liquid is being released therefrom.

7. A refrigerant circuit for selectively refrigerating or heating an evaporator, said circuit comprising an elongated evaporator tube having an inlet end and an outlet end, a compressor, a condenser for receiving compressed refrigerant vapor from said compressor, a liquid line including a pressure-reducing device for conducting refrigerant liquid from said condenser to the inlet end of said evaporator tube, storage means communicating with the outlet end of said evaporator tube for selectively trapping refrigerant liquid or releasing said trapped refrigerant liquid, said evaporator tube having a portion of the inlet end thereof arranged in heat-transfer relationship with said storage means, a suction conduit connecting said storage means and said compressor, means for heating a portion of said suction conduit and heating means for warming the inlet end of said evaporator tube.

GRAHAM S. McCLOY.

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